

# CONCEPT MAP

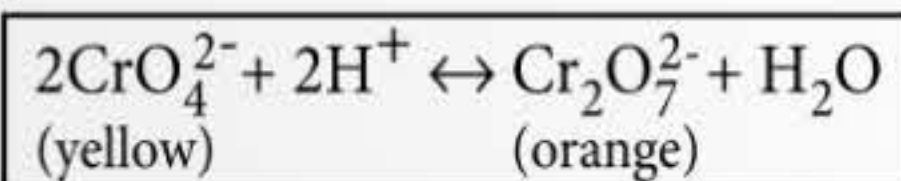
CLASS XI

## Le Chatelier's Principle

If a system in dynamic equilibrium is disturbed, the position of equilibrium will shift so as to cancel out the effect of change and a new equilibrium can be established again.

### Effect of Concentration Change

- Increase in conc. of reactants or decrease in conc. of products shifts the equilibrium to forward direction.
- Increase in conc. of products or decrease in conc. of reactants shifts the equilibrium to backward direction.



#### Increase $\text{H}^+$ conc.

- By adding  $\text{H}^+$
- Equilibrium shift towards right.
- Formation of  $\text{Cr}_2\text{O}_7^{2-}$  (orange)

#### Decrease $\text{H}^+$ conc.

- By adding  $\text{OH}^-$
- Equilibrium shift towards left.
- Formation of  $\text{CrO}_4^{2-}$  (yellow)

### Effect of Pressure Change

- Applicable only in case of gaseous reactions and reactions which proceed with a change in number of moles of gaseous reactants and products.
- Increase in pressure shifts the equilibrium towards lesser number of gaseous molecules.
- Decrease in pressure shifts the equilibrium towards larger number of gaseous molecules.

Pressure-volume changes do not change the value of equilibrium constant as long as the temperature remains constant.

### Effect of Volume Change

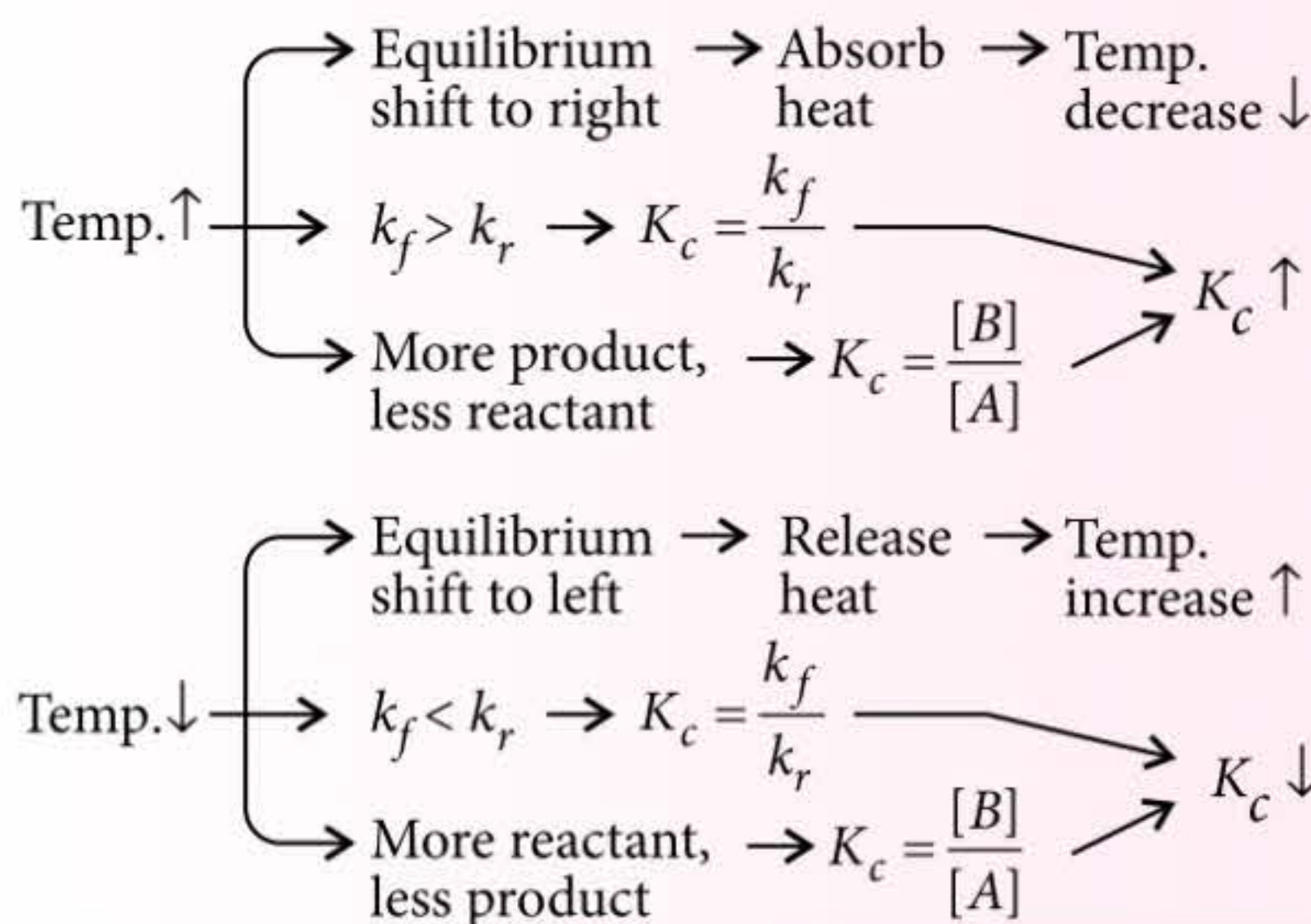
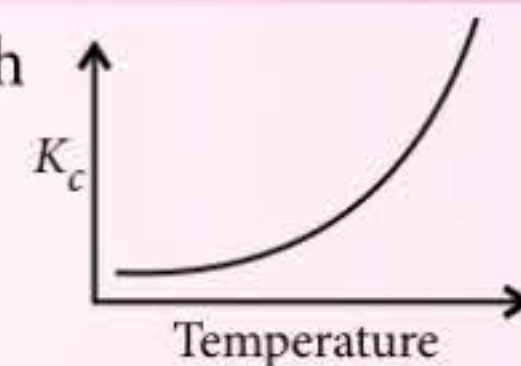
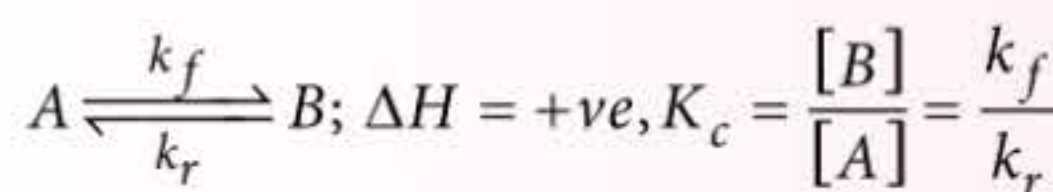
- The effect of change of volume will be exactly reverse to that of pressure.
- Decrease in volume shifts the equilibrium towards lesser number of gaseous molecules.
- Increase in volume shifts the equilibrium towards larger number of gaseous molecules.

### Effect of Catalyst

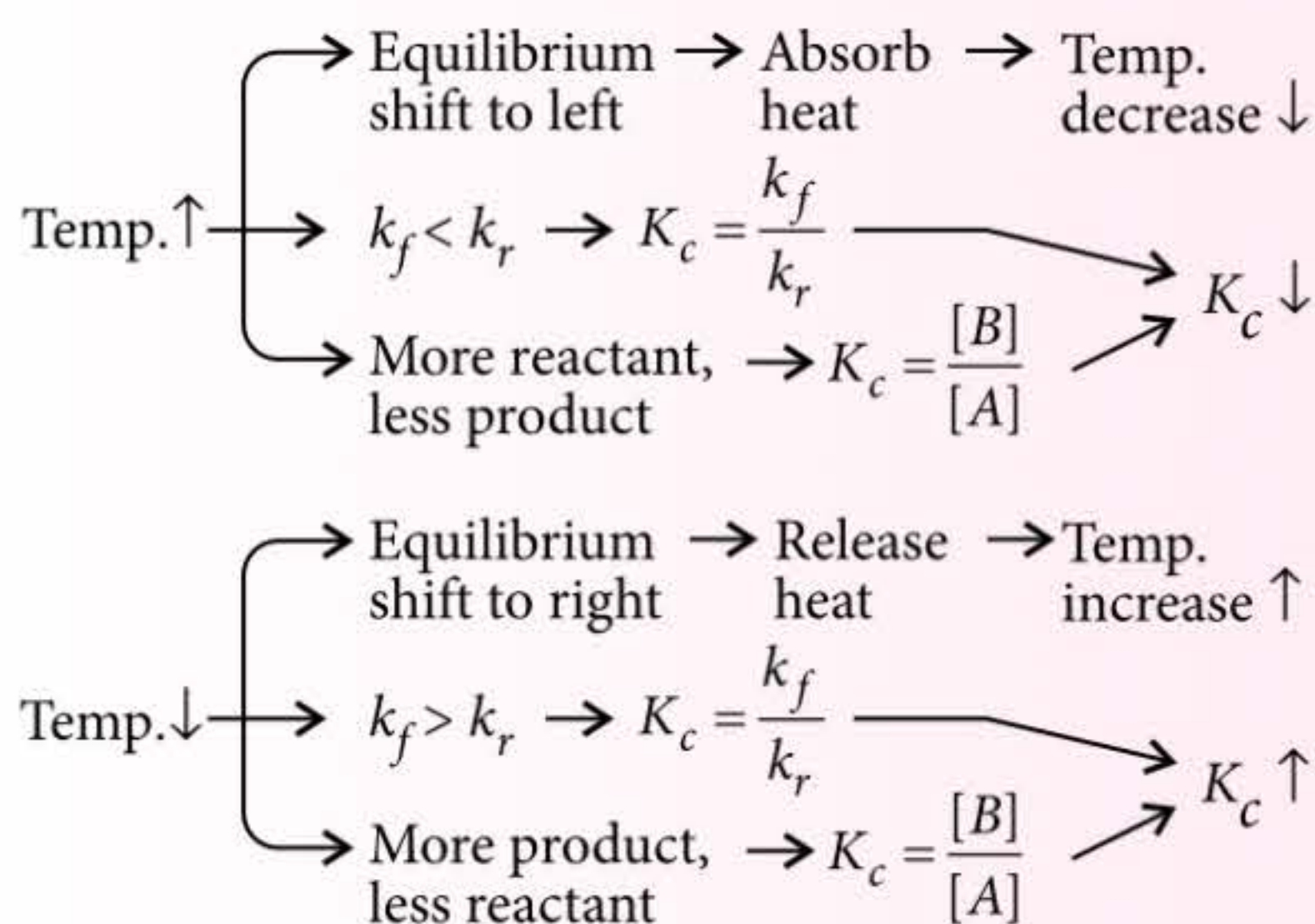
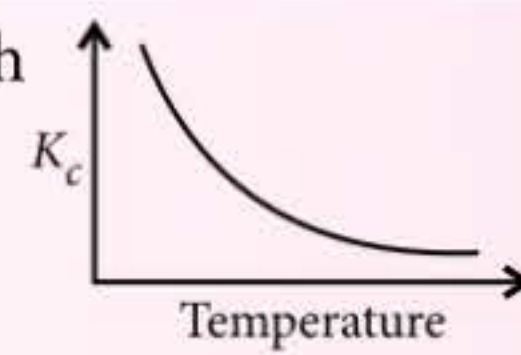
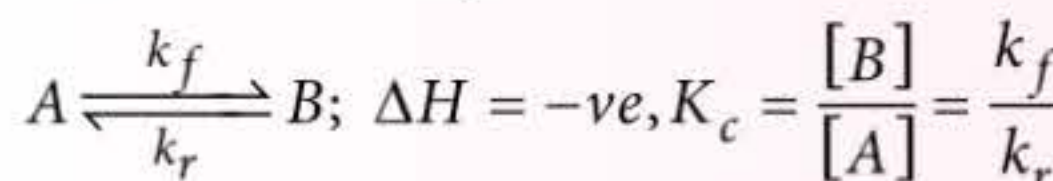
- Catalyst has no effect on equilibrium, it simply helps to achieve the equilibrium quickly.
- Position of equilibrium and  $K_c$  unchanged.
- Provides an alternative pathway with lower activation energy.
- Increases forward and reverse rates to the same extent.
- Catalyst shortens the time to reach equilibrium.

### Effect of Temperature Change

- **Endothermic reaction** is favoured with increase in temperature.



- **Exothermic reaction** is favoured with decrease in temperature.



### Effect of Inert Gas Addition

- Addition of an inert gas at constant volume has no effect on equilibrium.
- Addition of an inert gas at constant pressure will shift the equilibrium towards larger number of gaseous molecules.

Condition		Effect
$\Delta V = 0, V = \text{Constant}$	$\Delta n = 0, +ve \text{ or } -ve$	No effect
At constant pressure	$\Delta n = 0$	No effect
	$\Delta n > 0$	Forward shift
	$\Delta n < 0$	Backward shift